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ASSIGNMENT BOOKLET
SCN3240 Chemistry 30
Module 3 Assignment

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Chemistry 30

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we explore

Electrochemical Reactions

Module 3

Assignment Booklet

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FOR TEACHER'S USE ONLY

Summary

	Total Possible Marks	Your Mark
Lesson 2 Assignment		
Lesson 3 Assignment		
Lesson 4 Assignment		
Lesson 5 Assignment		

Teacher's Comments

Chemistry 30 Learn EveryWare
Module 3: Electrochemical Reactions
Assignment Booklet
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Teachers	✓
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General Public	
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Read all parts of your assignment carefully, and record your answers in the appropriate places. If you have difficulty with an assignment, go back to the textbook and review the appropriate lesson. Be sure to proofread your answers carefully before submitting your Assignment Booklet.

MODULE 3: LESSON 2 ASSIGNMENT

Lesson 2 Assignment: Predicting Redox Reactions

Part 1: Lab—Spontaneity of Redox Reactions

1. Record the data from the virtual investigation using this table.

Metal	$AgNO_3(aq)$	$Cu(NO_3)(aq)$	$Mg(NO_3)_2(aq)$	$Zn(NO_3)_2(aq)$
Ag(s)				
Cu(s)				
Mg(s)				
Zn(s)				

Analysis

2. List the metals in order of most reactive to least reactive based on the number of times they were involved in spontaneous reactions.

3. List the metal ions in order of most reactive to least reactive based on the number of times they were involved in spontaneous reactions.

4. Comment on the lists prepared in your answers to questions 2 and 3. Provide a possible explanation for the pattern shown in these lists.

5. Identify which set of reactants, the metals or the metal ions in solution, act as oxidizing agents. Support your answer using empirical evidence and a theoretical explanation.

6. Write balanced half-reactions and net ionic equations for the spontaneous reaction involving copper, Cu(s), and silver nitrate, $AgNO_3(aq)$.

Part 2: Lab Exercise 13.A on page 572 of the textbook

1. Place your responses to Analysis questions (a) and (b) on page 572 of the textbook in the answer box below.

Lesson 3 Assignment: Half-Reactions

Lab—Testing Predictions for Redox Reactions

Pre-Lab

1. Use your knowledge of redox reactions to predict which of the combinations of reactants below will result in a spontaneous reaction. Support your prediction by showing a net ionic equation and describing one observation of reaction you would expect from each spontaneous reaction.

System	Reactant 1	Reactant 2
1	$HCl_{(aq)}$	Cu(s)
2	$HCl_{(aq)}$	Mg(s)
3	$Cu(NO_3)_{2(aq)}$	$Sn_{(s)}$
4	$NaOH_{(aq)}$	$I_2(aq)$
5	$Cu(NO_3)_2(aq)$	Mg(s)

2. Design an experiment to test the predictions you made in question 1. Make sure you consider safety aspects when suggesting how these substances should be manipulated and how waste from the reactions should be disposed of. Include a description of how to perform any diagnostic tests that may be required.

Virtual Investigation

3. Record you observations from the virtual investigation for this lab.

1	Observations of Reactants	$HCl(aq)$	$Cu(s)$
	Observations After Reactants Combined		
2	Observations of Reactants	$HCl(aq)$	$Mg(s)$
	Observations After Reactants Combined		
3	Observations of Reactants	$Cu(NO_3)_2(aq)$	$Sn(s)$
	Observations After Reactants Combined		
4	Observations of Reactants	$NaOH(aq)$	$I_2(aq)$
	Observations After Reactants Combined		
5	Observations of Reactants	$Cu(NO_3)_2(aq)$	$Mg(s)$
	Observations After Reactants Combined		

Analysis

4. Is the method you used to make predictions for the outcome of redox reactions valid? Make specific reference to your predictions and the observed results to support your answer.

Lesson 4 Assignment: Oxidation Numbers and Corrosion Protection

Part 1: Lab—Oxidation States of Manganese

1. Use the photographs in the table "Oxidation States of Manganese" in Step 1 of the virtual investigation to identify the final oxidation state of manganese in the solution within each of the jars.

2. Use a half-reaction to describe the chemical change occurring to the manganese ion in Jar 3 as it changes from $MnO_4^-(aq)$ to $Mn^{2+}(aq)$ in acidic conditions.

3. Use a half-reaction to describe the chemical change occurring to the manganese ion in Jar 4 as it changes from $MnO_4^-(aq)$ to $MnO_2(s)$ assuming acidic conditions.

4. Identify and explain the oxidation number for the manganese ion in each of the following compounds associated with the virtual investigation:

   a. $MnSO_4(s)$ (added to Jars 3 and 4)

   b. MnO_4^{2-}(the product of the reaction in Jar 2)

Part 2: Lab—Corrosion of Nails

Data

1. Data: Record your observations in a suitable data table.

Analysis

2. Use your knowledge of electrochemical reactions to explain the change or lack of change in the iron nail in each of the test tubes prepared.

3. Evaluate whether the experiment allows for the collection of sufficient data to identify factors that influence the corrosion of iron.

4. What are the limitations of the experimental design to permit generalizations?

Part 3: Questions

1. Complete "Section 13.3" question 8.b. on page 595 of the textbook

2. Use your answer to question 1 to answer questions a through d below.

   a. Assign oxidation numbers to all atoms/ions in your answer to questions 1.

   b. Identify the atom that is oxidized in this reaction. Describe the change in this atom as a result of the reaction.

   c. Identify the atom that is reduced in this reaction. Describe the change in this atom as a result of the reaction.

   d. Identify the oxidizing and reducing agents in this reaction.

Lesson 5 Assignment: Redox Stoichiometry

Part 1: Lab—Analyzing a Hydrogen Peroxide Solution

1. Paste a copy of the data you collected from this investigation in the space below.

2. Use the data collected in Procedure steps 1–7 to calculate the concentration of the potassium permanganate solution.

3. Use your answer from question 2 and the data collected from Procedure steps 8–11 to calculate the concentration of the diluted hydrogen peroxide solution tested.

4. Use the information in the Design section on page 603 of the textbook to determine the percentage by volume concentration of the commercial hydrogen peroxide product.

Part 2: Reflect and Connect

1. Calculate the volume of water that can be treated if 50 g of potassium permanganate is added to the system. Assume that the concentration of iron(II) ions in well water is 6.5 ppm.

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